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Publications of the Space
Physiology and Countermeasures
Program, Regulatory Physiology
Discipline: 1980-1990

Janice Wallace-Robinson, Katherine J. Dickson,
Elizabeth Hess, and Janet V. Powers

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PREFACE

This bibliography contains publications resulting from research supported by the Regulatory Physiology Discipline of the NASA Space Physiology and Countermeasures Program during the years 1980-1990. It is one of a series of four bibliographies being published in 1992 of the disciplines of the Space Physiology and Countermeasures Program. Others in this series include publications from the Musculoskeletal, Cardiopulmonary, and Neuroscience Disciplines. Portions of this compilation have been published previously as part of a series of bibliographies of space biomedical research. Previous editions in this series cover the years 1980-1982 (NASA CR-3587), 1982-1983 (NASA CR-3739), 1983-1984 (NASA CR-3860), 1984-1986 (NASA CR-4184), and 1987-1988 (NASA CR-187840).

This bibliography is divided into nine sections: Circadian Rhythms, Endocrinology, Fluid and Electrolyte Regulation, Hematology, Immunology, Metabolism and Nutrition, Temperature Regulation, General Regulatory Physiology, and General Physiology. The last section is included to provide the reader with additional, background material in space physiology research. NASA-funded investigators whose work resulted in these publications are identified by an asterisk. A principal investigator index, as well as a list of investigators and their affiliations, is also included in the bibliography.

As part of our continuing interaction with the scientific and professional community, we are pleased to present this bibliography in an effort to stimulate an exchange of information and ideas among scientists working in this discipline. I would like to thank April Commodore Roy and Audrey Robin Brown for their technical assistance in the production of this bibliography.

Janis H. Stoklosa, Ph.D.
Manager, Space Physiology and Countermeasures Program

INTRODUCTION

The Regulatory Physiology Discipline is part of the Space Physiology and Countermeasures Program of the NASA Life Sciences Division. Space life sciences research was initiated in 1960 with the goal of enabling human survival in space. Now, in the late 20th century, the program is evolving to ensure human health and productivity on space missions: on the space shuttle in the 1990s, then on Space Station Freedom, and ultimately on the Moon and missions to Mars.

The goals of the Regulatory Physiology Discipline are to determine and understand the short- and long-term physiological adaptation(s) of humans to the space environment and to evaluate the efficacy of physiological and performance countermeasures. The Regulatory Physiology research program is comprised of several subdisciplines: Circadian Rhythms, Endocrinology, Fluid and Electrolyte Regulation, Hematology, Immunology, Metabolism and Nutrition, and Temperature Regulation.

The objective of the Circadian Rhythms subdiscipline is to describe and understand the effects of gravity and the spaceflight environment on biological rhythms of various physiological systems. This subdiscipline is concerned with determining the effects of the space environment and intermittent or variable gravity fields on sleep, sleep cycles, and the generation, expression, and entrainment of metabolic, endocrine, and/or behavioral circadian rhythms.

The objective of the Endocrinology subdiscipline is to understand the hormonal mechanisms that underlie the physiological responses to spaceflight. It is concerned with determining the effects of spaceflight on the endocrine system and the effects of these changes on other homeostatic systems (e.g., cardiovascular, nervous, immune, gastrointestinal, and energy metabolism). It also studies the hypothalamic-pituitary-adrenal and opioid system responses to normal spaceflight events.

The objective of the Fluid and Electrolyte Regulation subdiscipline is to describe and understand the effects of spaceflight on renal function, fluid distribution, and electrolyte regulation. It seeks to determine the time course and magnitude of fluid shifts and changes in fluid compartment volumes during acclimatization to hypogravity and during return to 1 g after flight. It also studies the fluid and electrolyte regulating mechanisms underlying the cardiovascular responses during spaceflight, as well as the effects of microgravity on renal function and stone formation.

The objective of the Hematology subdiscipline is to characterize the anemia that is present following spaceflight and to determine the causes and mechanisms involved in the loss of red blood cell mass. This subdiscipline focuses on the time course, magnitude, and mechanisms of changes in the erythropoietic system during spaceflight, and on whether the loss of red blood cell mass represents a normal microgravity-associated adaptive process or a transient response to changes brought about by various spaceflight-related stimuli.

The objective of the Immunology subdiscipline is to define and understand the changes in immunocompetency that occur in response to spaceflight. It is concerned with determining how spaceflight affects the humoral or cell-mediated immune functions, nonspecific immunity, or immune surveillance capabilities of space crews, and if these changes predispose crewmembers to unacceptable medical risks while on a mission or upon return to Earth.

The objective of the Metabolism and Nutrition subdiscipline is to understand and describe changes in metabolism that occur in spaceflight and define how and to what extent nutritional requirements may be altered. This subdiscipline seeks to determine if energy requirements, basal metabolic rate, metabolic efficiency, pharmacokinetics of drugs, or food consumption change during spaceflight.

The objective of the Temperature Regulation subdiscipline is to understand the effects of gravity and spaceflight on the regulation of body temperature and thermal comfort of the crew. Determining the compounded effects of microgravity and extravehicular activity and the effects of prescribed countermeasures on thermoregulation and heat exchange, and how changes in body temperature or its regulation correlate with metabolic rate and energy expenditure are the focus of this subdiscipline.

Janis H. Stoklosa, Ph.D.
Manager, Space Physiology and Countermeasures Program

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